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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

10/13/00

SECRET NUMBER	ANTICIPATED CLASSIFICATION OF THIS APPLICATION:		PRIOR APPLICATION	
	CLASS	SUBCLASS	EXAMINER	ART UNIT
26USD1			Henry	2872

CERTIFICATE UNDER 37 CFR 1.10

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Date of Deposit October 13, 2000

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By
Name

Linda McCormick
Linda McCormick

10/13/00
09/689989
U.S. PTO

DIVISIONAL APPLICATION UNDER 37 C.F.R. § 1.53(b)

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, DC 20231

Dear Sir:

This is a request for filing a divisional application under 37 CFR § 1.53(b) of Serial No. 09/122,947, filed on July 27, 1998 entitled OUTSIDE PLANT FIBER DISTRIBUTION APPARATUS AND METHOD by the following inventor(s):

Full Name Of Inventor	Family Name	First Given Name	Second Given Name
Residence & Citizenship	City	State or Foreign Country	Country of Citizenship
Post Office Address	Post Office Address	City	State & Zip Code/Country
Full Name Of Inventor	Family Name	First Given Name	Second Given Name
Residence & Citizenship	City	State or Foreign Country	Country of Citizenship
Post Office Address	Post Office Address	City	State & Zip Code/Country
Full Name Of Inventor	Family Name	First Given Name	Second Given Name
Residence & Citizenship	City	State or Foreign Country	Country of Citizenship
Post Office Address	Post Office Address	City	State & Zip Code/Country

1. ☒ Enclosed is a copy of the prior application; including the specification, claims, drawings, oath or declaration showing the applicant's signature, and any amendments referred to in the oath or declaration filed to complete the prior application. (It is noted that no amendments referred to in the oath or declaration filed to complete the prior application introduced new matter therein.) The continuing application is as follows: 10 pages of specification, 29 claims, 1 pages of abstract, 21 sheets of drawings, and 4 pages of oath or declaration.

- ☒ The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

2. ☒ Cancel original claims 1-17 of this application before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)
3. ☒ The filing fee is calculated below:

CLAIMS AS FILED

NUMBER FILED	NUMBER EXTRA		RATE	FEE
TOTAL CLAIMS: 12 -20	0	x	\$18.00	0.00
INDEPENDENT CLAIMS 3 -3	0	x	\$78.00	0.00
			BASIC FILING FEE:	\$690.00
			TOTAL FILING FEE:	690.00

☐ A Verified Statement that this filing is by a small entity is already filed in the prior application.

☐ A Verified Statement that this filing is by a small entity is attached.

4. ☒ Payment of fees:
☐ Attached is a check in the amount of
☐ Please charge Deposit Account No. 13-2725.
☒ **PAYMENT OF THE FILING FEE IS BEING DEFERRED.**

5. ☒ The Commissioner is hereby authorized to charge any additional fees as set forth in 37 CFR §§ 1.16 to 1.18 which may be required by this paper or credit any overpayment to Account No. 13-2725.

6. ☒ Amend the specification by inserting before the first line the sentence:

"This application is a divisional of application Serial No. 09/122,947, filed July 27, 1998, which application(s) are incorporated herein by reference."

7. ☐ A set of formal drawings (sheets) is enclosed.

8. ☐ Priority of application Serial No. , filed on in , is claimed under 35 U.S.C. 119.

☐ The certified copy has been filed in prior application Serial No. , filed .

9. ☒ The prior application is assigned of record to ADC Telecommunications, Inc. located at 12501 Whitewater Drive, Minnetonka, Minnesota 55343.

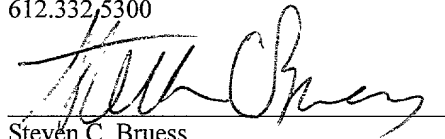
10. ☒ The Power of Attorney in the prior application is to:

Merchant & Gould P.C.
Minneapolis, MN 55402-2215

11. ☐ A preliminary amendment is enclosed. (Claims added by this amendment have been properly numbered consecutively beginning with the number next following the highest numbered original claim in the prior application.)
- ☐ Fee for excess claims is attached.
12. ☐ A petition and fee has been filed to extend the term in the prior application until . A copy of the petition for extension of time in the prior application is attached.
13. ☐ The inventor(s) in this application are less than those named in the prior application and it is requested that the following inventors identified above for the prior application be deleted:
14. ☐ Also Enclosed:
15. ☒ Address all future communications to the **Attention of Steven C. Bruess** (may only be completed by attorney or agent of record) at the address below.
16. ☒ A return postcard is enclosed.

Respectfully submitted,

MERCHANT & GOULD P.C.
P.O. Box 2903
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Steven C. Bruess
Reg. No. 34,130
SCB:ju



Date:

Oct. 13, 2000

OUTSIDE PLANT FIBER DISTRIBUTION APPARATUS AND METHOD

Field of the Invention

5 This invention relates to an apparatus for housing fiber optic telecommunications equipment in outside plant environments. More particularly, this invention relates to an enclosure and management apparatus for housing cross-connect and/or interconnect equipment for fiber optic telecommunications systems. This invention also relates to modules for housing optical couplers such as optical splitters,
10 wavelength division multiplexers.

Background of the Invention

With the increased use of fiber optic technology in telecommunications, there is a need for apparatus which permit access to cross-connect functions and
15 interconnect functions, while protecting the components in the field. For example, it is desirable to have access to fiber optic cables in outdoor locations such as contained within an enclosure adjacent to buildings which are linked at the enclosure to a feeder line.

In order to protect fiber optic connections from the environment and
20 from damage due to impact or vandalism, such equipment is housed in enclosures which may be securably locked from unauthorized access. An example enclosure is shown in U.S. Patent No. 5,734,776. The enclosure has a circular base, and a cylindrical shape. Enclosures with a more square shape are also known. Reltec (Reliable Electric) of Cleveland, Ohio sells a generally square enclosure, or pedestal, typically made of green
25 colored metal, identified as CAD12. The Reltec CAD12 enclosure is generally about 12 inches by 12 inches at the base and about three to four feet high.

Providing cross-connect and/or interconnect functions within the enclosure is desired. Ease of assembly of the system and ease of access for later maintenance of the system are also desired. There is a need for further apparatus and

methods for enclosing and managing outside plant equipment with cross-connect and interconnect functions. There is also a need for enclosing and managing fiber optic splice locations and optical couplers.

5

Summary of the Invention

An optical fiber distribution frame apparatus includes a frame member having upper and lower module mounting brackets and an interior. The upper and lower module mounting brackets are spaced apart to define a space for receipt of a plurality of fiber optic modules mounted to the frame member. Each module includes a front and two mounting flanges. Each mounting flange is mountable to one of the upper and lower module mounting brackets.

The modules are provided with one or more functions. One of the modules defines a connection module and further includes a rear spaced from the front, a spaced apart top and bottom positioned adjacent to the flanges, and spaced apart sides.

15 The connection module is configured and arranged for housing a plurality of connection locations having exposed openings along the front arranged in one or more vertical arrays. The bottom, the rear, and the opposed sides of the connection module define a cable notch region, wherein the cable notch region includes an opening for a first cable to enter the module. The first cable is connectable to the connection locations within an interior of the connection module either directly or through optical couplers. A further module defines a storage module including first and second spools positioned on the front.

The connection locations preferably define adapters for connection to connectors of fiber optic cables. Preferably, the adapters are angled downwardly when the connection module is mounted to the frame member.

An enclosure is preferably provided to surround the frame member for use in an outside plant application. In the case of configuring the optical fiber distribution frame apparatus as an interconnect system, the storage module preferably includes a cable clamp positioned on the front for clamping a second cable, wherein the

second cable is connectable to the connection locations on the connector module. The frame member preferably has a cable tray and an opening sized for receipt of the second cable. The interconnect system may also include a blank or filler module defining a generally planar front.

- 5 In the case of configuring the optical fiber distribution frame apparatus as a cross-connect system, two connection modules are provided, and the storage module is positioned between the two connection modules. One or more patch cords link the connection locations of the two connection modules.

- 10 The present invention also relates to a method of assembling an optical fiber distribution frame including the steps of providing a frame member, and selecting a plurality of fiber optic modules for mounting to the frame. The fiber optic modules are selected so as to fill the frame member with desired functions. Connection modules, storage modules, and blank or filler modules can be selected as desired. In the case of a cross-connect system, two connection modules are mounted to the frame member, with
15 a storage module positioned between the two connection modules and mounted to the frame member in one embodiment. In the case of an interconnect system, a connection module is mounted to the frame member, as well as a storage module in another embodiment.

- 20 The present invention also relates to individual components comprising an optical fiber distribution frame apparatus. A frame member defines an interior, and includes an open front bounded by upper and lower module mounting brackets. The lower module mounting brackets further include a plurality of openings configured and arranged for receiving cable.

- 25 A connection module in accordance with the present invention includes a front and two mounting flanges. A rear of the module is spaced from the front. A top and bottom are positioned adjacent to the flanges, and opposed spaced apart sides define an enclosed interior for the connection module. The connection module interior houses a plurality of connection locations having exposed openings along the front. The

bottom, the rear, and the opposed sides define a cable notch region wherein the cable notch region defines an opening for receiving a first cable.

A storage module in accordance with the present invention includes a front and two mounting flanges, and first and second spools in alignment extending
5 between the two mounting flanges. Side edges of the front further include projecting cable guides. In the case of a storage module for use in an interconnect system, a cable clamp is also positioned on the front for clamping a cable.

Blank or filler modules are also provided in accordance with the invention to fill unused space of the frame member. Each blank module includes a
10 generally planar front, and two mounting flanges. Side flanges extend in an opposite direction to the direction faced by the front.

The connection module may house within its interior a splice between the first cable entering the module through the cable notch region, and the individual cables leading to the connection locations on the front of the module or to one or more
15 optical couplers housed within the interior of the module. Example couplers include optical splitters and wavelength division multiplexers.

Brief Description of the Drawings

FIG. 1 is a front view of a fiber distribution apparatus in a cross-connect
20 configuration, with portions of the enclosure and the cover removed.

FIG. 2 is a front view of a fiber distribution apparatus in an interconnect configuration, with portions of the enclosure and the cover removed.

FIG. 3 shows the cross-connect fiber distribution apparatus of FIG. 1 including exemplary fibers in place.

25 FIG. 4 shows the interconnect fiber distribution apparatus of FIG. 1 including exemplary fibers in place.

FIG. 5 is an exploded perspective view of the frame and the cover.

FIG. 6 is a side view showing the cover mounted to the frame.

FIG. 7 is a front view of the frame.

FIG. 8 is a front view of a connection module, showing two exposed adapters for connecting to two connectors.

FIG. 9 is a side view of the connection module of FIG. 8, showing a first cable mounted to the rear in the cable notch and held by a cable clamp. Example
5 individual fibers within the module are also shown schematically.

FIG. 10 shows the bottom of connection module in greater detail.

FIG. 11 is a perspective view of one of the front adapters held by a clip and connected to two connectors.

FIG. 12 shows in greater detail a portion of the front of the connection
10 module with the adapters and clips.

FIG. 13 is a side view of a connection module like that shown in FIG. 9, and showing an exemplary fiber from the first cable linked to a splice, an optical splitter, and two front adapters, one from each vertical row.

FIG. 14 is a front view of the connection module of FIG. 13.

FIG. 15 is a side view of a connection module like that shown in FIG. 9, and showing an exemplary fiber from the first cable linked to a splice, a WDM, and two front adapters, one from each vertical row.
15

FIG. 16 is a front view of the connection module of FIG. 15.

FIG. 17 is a side view of a connection module like that shown in FIG. 9, and showing an exemplary fiber from the first cable linked to a splice, and a front adapter.
20

FIG. 18 shows an alternative connection module to the module of FIG. 8 with one vertical row of adapters.

FIG. 19 shows a second alternative connection module with three
25 vertical rows of adapters.

FIG. 20 is a perspective view of a cross-connect storage module.

FIG. 21 is a perspective view of an interconnect storage module.

FIG. 22 is a perspective view of a two-position blank module.

FIG. 23 is a one-position blank module.

Detailed Description of the Preferred Embodiments

Referring now to FIGS. 1 and 3, a fiber distribution apparatus 10 is shown for use in cross-connect applications. FIGS. 2 and 4 show a similar fiber
5 distribution apparatus 10' configured for interconnect applications. Both apparatus 10, 10' include an outer enclosure 20, and an inner frame 22 including a plurality of optical modules 23 mounted thereto. As will be described below in greater detail, modules 23 have particular functions, and apparatus 10, 10' is preferably provided with different modules 23 selected to have the desired functions for the particular application.

10 Enclosure 20 typically extends from the ground over underground cables 300, 302 (FIG. 3) and 400, 402 (FIG. 4) which extend upwardly from the ground and contain multiple individual optical fibers or bundles of fibers. Cables 300, 302, 400, 402 may be single cables or multiple cables. Enclosure 20 protects the inner components, in this case fiber optic telecommunications equipment. Enclosure 20 can
15 be any convenient structure sized to protect frame 22 and modules 23. In the drawings, enclosure 20 includes a main vertical portion 40 extending from the ground and a top cap 42. Typically, a movable front door is provided, and a lock provides secure access.

Referring now to FIGS. 1-7, frame 22 is secured to main portion 40 of enclosure 20 along a rear side 41 of main portion 40. Frame 22 includes a base or
20 bottom 50, and an opposed top 52. Frame 22 further includes a front 54, and an opposed rear 56, and spaced apart sides 58. Rear 56 of frame 22 can be screwed, riveted, or otherwise fastened to rear side 41 of main portion 40 of enclosure 20 through holes 62.

Frame 22 further includes an upper module mounting bracket 66, and a
25 lower module mounting bracket 68 extending between sides 58. Each module mounting bracket 66, 68 receives a plurality of modules 23 connected via fasteners 70, such as screws, or other fasteners. Preferably, the fasteners are releasable to enable removal of modules 23, as desired, such as for repair, or replacement. Each of the module mounting brackets 66, 68 includes a plurality of holes 67, 69 for receipt of fasteners 70.

Lower module mounting bracket 68 defines a cable tray 60 (FIG. 5) including a plurality of lower holes 72, each sized for receipt of one or more cables, as will be described in greater detail below.

A cover 76 (FIGS. 5 and 6) mounts to frame 22 so as to close front 74.

- 5 Side flanges 78 of cover 76 include a plurality of downwardly angled slots 80 for receipt of pins 82 extending from sides 58, 60 of frame 22. Nuts, such as wing nuts, can be mounted to pins 82 with threads to help secure cover 76 to frame 22.

- Referring now to FIGS. 1-4, and 8-12, a connection module 24 is shown. Connection module 24 comprises one of modules 23. Connection module 24 includes a front 90 defining a plurality of connection locations 91. Front 90 also includes opposed mounting flanges 92, 94 extending along front 90 for mounting to module mounting brackets 66, 68 of frame 22. Each of flanges 92, 94 includes a plurality of holes 96, 98 for receiving fasteners 70. A spaced apart rear 100 of connection module 24, and a spaced apart top 102 and bottom 104, and opposed, spaced apart sides 106, 108 define an interior region. A cable notch 110 formed by portion of rear 100, bottom 104, and sides 106, 108 receives a cable 300 for connection to the connection locations 91 within the interior of module 24. Notch 110 further includes an opening 112 for cable 300. Opening 112 is large enough to receive one or more additional cables.
- 10
15

- Each of the connection locations 91 preferably includes an adapter 200 for mounting to a fiber optic connector, such as an SC (shown), an ST, an FC, or other connector. Cable 300 entering connector module 24 at opening 112 includes its individual fibers connected to the individual connection locations 91, as desired. Two illustrated example fibers 300a, 300b of cable 300 connect to two connection locations 91. A connector 208 (FIG. 11) is preferably on an end of fibers 300a, 300b. Adapter 200 preferably has two ends 202 and 204. End 202 is disposed within module 24 for connection to connector 208. Opposite end 204 defines the exposed opening of the connection location 91 along the front of module 24 for connection to a second connector 218. A clip 210, such as the clip disclosed in U.S. Patent No. 5,214,735 may be used to releasably attach each adapter to module 24. Clip 210 also angles connection
- 20
25

locations 91 downwardly when module 24 is installed in frame 22 as in the drawings. Each clip 210 holds each adapter 200 in one of the openings 93 of front 90 of module 24 to define each connection location in the preferred embodiment. In the illustrated embodiment of module 24, only two connection locations 91 are shown, but a fully loaded module 24 would define a connection location 91 at each opening 93. Clip 210 is preferably a snap mounted clip to enable easy assembly. A removable clip 210 is preferred to allow cleaning of connector 208 and end 202 if desired.

A similarly configured second connection module 24a is mounted to frame 22 to permit cross-connection through the use of patch cords 114a, 114b (FIG. 3) to cross-connect between the fibers of each cable connected to the respective connection modules 24, 24a. Cable 302 is connected to the rear of module 24a as cable 300 is for module 24. Patch cords 114a, 114b, and fibers 300a, 300b are shown schematically in FIGS. 3 and 9, but each fiber has a connector like connectors 208, 218 to mate with adapter 200. Alternatively, other connector systems as noted above can be used, as desired.

Each connection module 24, 24a can be made of sheet metal sections, held together with fasteners, such as screws, so as to allow access as desired to the interior of each module.

To facilitate cable management, and cable protection, a cross-connect storage module 26 as one of modules 23 is provided having three spools 116 along a front 120 (FIGS. 1, 3 and 20). Along a front 120 of an interconnect storage module 26a as one of modules 23 is provided two spools 116 (FIGS. 2, 4 and 21). Flanges 124, 126 permit mounting of each storage module 26, 26a to frame 22 in a similar manner as modules 24, 24a. Holes 128, 130 receive fasteners 70 to mount storage modules 26, 26a to frame 22. Front projections 118 along vertical side edges 117 further enable cable management and cable protection during use. A cable clamp 134 (FIG. 4) is provided for front mounting of one or more cables to storage module 26a for the interconnect system. Posts 135 (FIG. 21) hold the clamp pieces.

Cable notch 110 is useful to avoid excess cable bending during manipulation and positioning of connection modules 24. The use of notch 110 provides a greater distance between the cables extending upward from the ground to the clamp mounting locations on modules 24. The extra distance is advantageous when

5 manipulating module 24 as it is installed into or removed from frame 22.

In the example cross-connect system of FIG. 3, two fibers 300a, 300b (FIG. 9) of cable 300 are shown as optically linked to two fibers of cable 302 through patch cords 114a, 114b in a cross-connect application between modules 24, 24a. In the example interconnect system of FIG. 4, two fibers 402a, 402b of cable 400 are shown as
10 optically linked to two fibers of cable 400.

Referring now to FIGS. 18 and 19, alternative connection modules 224, 226 include different numbers of vertical rows of connector locations 91. Modules 24, 24a included two vertical rows. Connection module 224 includes a single row of connection locations 91, and connection module 226 includes three. Four or more rows
15 are also possible.

Referring now to FIGS. 13-17, module 24 is shown as including optical components such as splices and/or optical couplers within the module between cable 300, and connection locations 91. In FIGS. 13 and 14, a splice 350 to a one-by-two optical splitter 351 allows for module 24 to have line and monitor functions associated
20 with connection locations 91. Row 352 of connection locations 91 could serve as the line function, and row 354 could serve as the monitor function. Each pair of connection locations 91 (one from each row) would be linked to one of the fibers of cable 300 in FIG. 13. Other splitters, such as one-by-fours, etc. may be used, as desired.

In FIGS. 15 and 16, a splice 360 to a wave division multiplexer (WDM)
25 361 allows for module 24 to have wavelength division multiplexing functions associated with connection locations 91. A "dense" wave division multiplexer may be used, if desired (DWDM). For the multiplexing function, row 362 of connection locations 91 could serve as the first wavelength ports, and row 364 could serve as the

different wavelength ports. Each pair of connection locations 91 (one from each row) would be linked to one of the fibers of cable 300 in FIG. 15.

FIG. 17 shows just a splicing component 370 so that each fiber of cable 300 could be spliced to a fiber leading to one connection location 91. Other passive
5 optical components can be selected as desired to provide module 24 with the desired function or functions.

Referring now to FIGS. 22 and 23, blank panels 150, 170 comprising modules 23 are shown. Each blank panel 150, 170 includes a generally planar front 152, and flanges 154 including holes 158, 160 to enable mounting of the blank modules
10 150, 170 to frame 22. Blank modules 150, 170 are utilized to fill open spaces of frame 22. Blank module 170 is a single width, and blank module 150 is a double width. Additional widths can be supplied as desired.

During assembly of a system for a particular outside plant application, the desired function (cross-connect, interconnect, other) is selected. The types of
15 modules 23 (connection, storage, blank) and widths of modules 23 are also selected. Further the types of connections and whether any optical splices or optical couplers are to be utilized are selected. The appropriate modules are selected and then mounted to frame 22 within an enclosure 20. Over time, the modules 23 can be removed for repair, replacement, or to change functions. Also, the front connections can be changed as the
20 need arises.

The above specification, examples and data provide a complete description of the manufacture and use of the composition of the invention. Since many embodiments of the invention can be made without departing from the spirit and scope of the invention, the invention resides in the claims hereinafter appended.

25

WHAT IS CLAIMED IS:

1. An optical fiber distribution frame apparatus comprising:
 - a frame member having upper and lower module mounting brackets, the upper module mounting bracket spaced from the lower module mounting bracket, the frame member defining an interior;
 - a plurality of fiber optic modules mounted to the frame member, each module including a front and two mounting flanges, each mounting flange mountable to one of the upper and lower module mounting brackets;
 - wherein one of the modules defines a connection module and further including a rear spaced from the front, a spaced apart top and bottom positioned adjacent to the flanges, and opposed spaced apart sides, the connection module configured and arranged for housing a plurality of connection locations having exposed openings along the front, wherein the bottom, the rear, and the opposed sides defining a cable notch region, wherein the cable notch region defines an opening for a first cable;
 - a cable clamp mounted to the rear of the connection module;
 - wherein another one of the modules defines a storage module including first and second spools positioned on the front.
2. The apparatus of claim 1, wherein releasable fasteners mount each of the plurality of modules to the frame member.
3. The apparatus of claim 1, further comprising an enclosure surrounding the frame member.
4. The apparatus of claim 1, wherein the storage module includes a cable clamp positioned on the front for clamping a second cable.
5. The apparatus of claim 4, wherein the frame member has a cable tray and an opening sized for receipt of the second cable.

11. The apparatus of claim 1, wherein the connection module includes an optical coupler for linking the first cable and cables connected to the connection locations.
12. The apparatus of claim 11, wherein the optical coupler includes a splitter.
13. The apparatus of claim 11, wherein the optical coupler includes a wavelength division multiplexer.
14. The apparatus of claim 1, wherein the connection locations are each defined by an adapter configured and arranged for receiving an optical fiber connector.
15. A method of assembling an optical fiber distribution frame comprising the steps of:
 - providing a frame member having upper and lower mounting locations;
 - mounting the frame member to an enclosure extending from the ground over at least two fiber optic cables;
 - selecting a plurality of fiber optic modules for mounting to the frame member selected so as to fill the frame member with desired functions, at least one of the modules including a connection module for mounting to a cable in the rear, and providing a plurality of connection locations on the front, a further module including a storage module including at least one spool on the front;
 - mounting each of the selected modules to the upper and lower mounting locations of the frame member so that the fronts face the same direction; and
 - connecting the two cables through the connection modules.
16. The method of claim 15, wherein two connection modules are mounted to the frame member, with the storage module positioned between the two connection modules, the two cables each mounted to a respective connection module with a clamp, the two cables connected to one another through at least one patch cord connecting connection location on the fronts of each of the respective connection modules.

17. The method of claim 15, wherein one of the cables is mounted to the storage module with a clamp.

18. An optical fiber distribution frame for use with modules and mountable to an enclosure comprising:

a frame member defining an interior, and including an open front bounded by upper and lower module mounting brackets, each of the mounting brackets including a plurality of openings for receipt of fasteners to mount the modules to the mounting brackets, the lower module mounting brackets further including a plurality of openings each configured and arranged for selectively receiving at least one cable, the frame member including a rear spaced from the mounting brackets configured and arranged for mounting the frame member to the enclosure.

19. A connection module comprising:

a housing including a front and two mounting flanges, a rear of the housing spaced from the front, a top spaced apart from a bottom, the top and the bottom positioned adjacent to the mounting flanges, and opposed spaced apart sides;

a plurality of connection locations having exposed openings along the front; the bottom, the rear, and the opposed sides defining a cable notch region wherein the cable notch region defines an opening for receiving a first cable; and a cable clamp extending from the rear in the cable notch region.

20. The connection module of claim 19, wherein the connection locations include a plurality of adapters configured and arranged for connection to an optical fiber connector, the adapters positioned at an angle having a component angle in the direction of the bottom of the housing.

21. The connection module of claim 20, further comprising clips which are snap fit to the front of the housing, the clips each holding at least one adapter.

22. The connection module of claim 19, wherein the connection locations include a plurality of adapters, and further comprising a first cable connected to the housing by the clamp, and interior cables optically connected to the adapters, the interior cables optically connected to a splice, the splice optically connected to the first cable.
23. The connection module of claim 19, wherein the connection locations include a plurality of adapters, and further comprising a first cable connected to the housing by the clamp, and interior cables optically connected to the adapters, the interior cables optically connected to a optical coupler, the optical coupler optically connected to the first cable.
24. The connection module of claim 23, wherein the optical coupler includes a splitter.
25. The connection module of claim 23, wherein the optical coupler includes a wavelength division multiplexer.
26. The connection module of claim 24, further comprising a splice between the first cable and the splitter.
27. The connection module of claim 25, further comprising a splice between the first cable and the wavelength division multiplexer.
28. A storage module comprising:
 - a body having a front, two ends, and two sides extending between the two ends;
 - the ends defining two mounting flanges including at least one hole sized for receipt of a fastener;
 - first and second spools positioned on the front in alignment between the two mounting flanges;

the sides including projecting cable guides.

29. The storage module of claim 28, further comprising a cable clamp positioned on the front for clamping a cable, the cable clamp positioned between the first and second spools and one of the mounting flanges.

OUTSIDE PLANT FIBER DISTRIBUTION APPARATUS AND METHOD

ABSTRACT OF THE DISCLOSURE

An outside plant fiber distribution apparatus includes a frame member and a plurality of fiber optic modules mounted to the frame member. The frame member includes upper and lower module mounting brackets. Each module includes a front and two mounting flanges, each mountable to one of the upper and lower module mounting brackets. At least one of the modules is configured as a connection module including a plurality of connection locations disposed along the front of the module. A rear of the module includes a cable notch region for receipt of a cable. At least one of the modules defines a storage module including first and second spools. In an interconnect system, the storage module includes a cable clamp for holding a second cable, the cables are connected through the connection locations of the connection module. In a cross-connect system, two connection modules are provided, and patch cords are used to connect the fronts of the connection modules. The modules may also house splices, and/or optical couplers, such as splitters and wave division multiplexers.

CERTIFICATE UNDER 37 CFR 1.10:

"Express Mail" mailing label number: EL039321686US

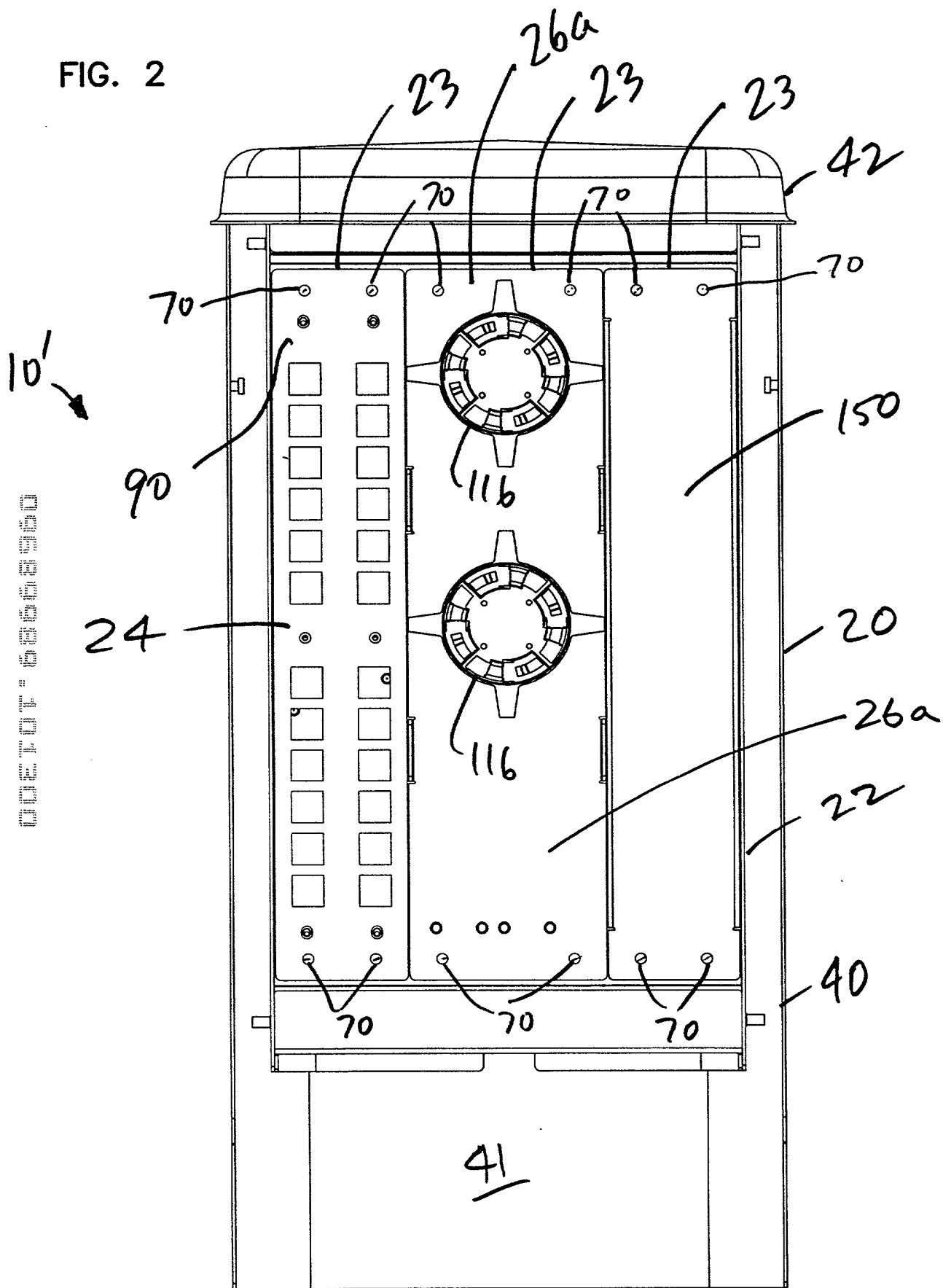
Date of Deposit: July 27, 1998

I hereby certify that this paper or fee is being deposited with the U.S. Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to BOX PATENT APPLICATION, Assistant Commissioner for Patents, Washington, D.C. 20231.

By: Mark L. Green

Name: Mark Green

FIG. 2



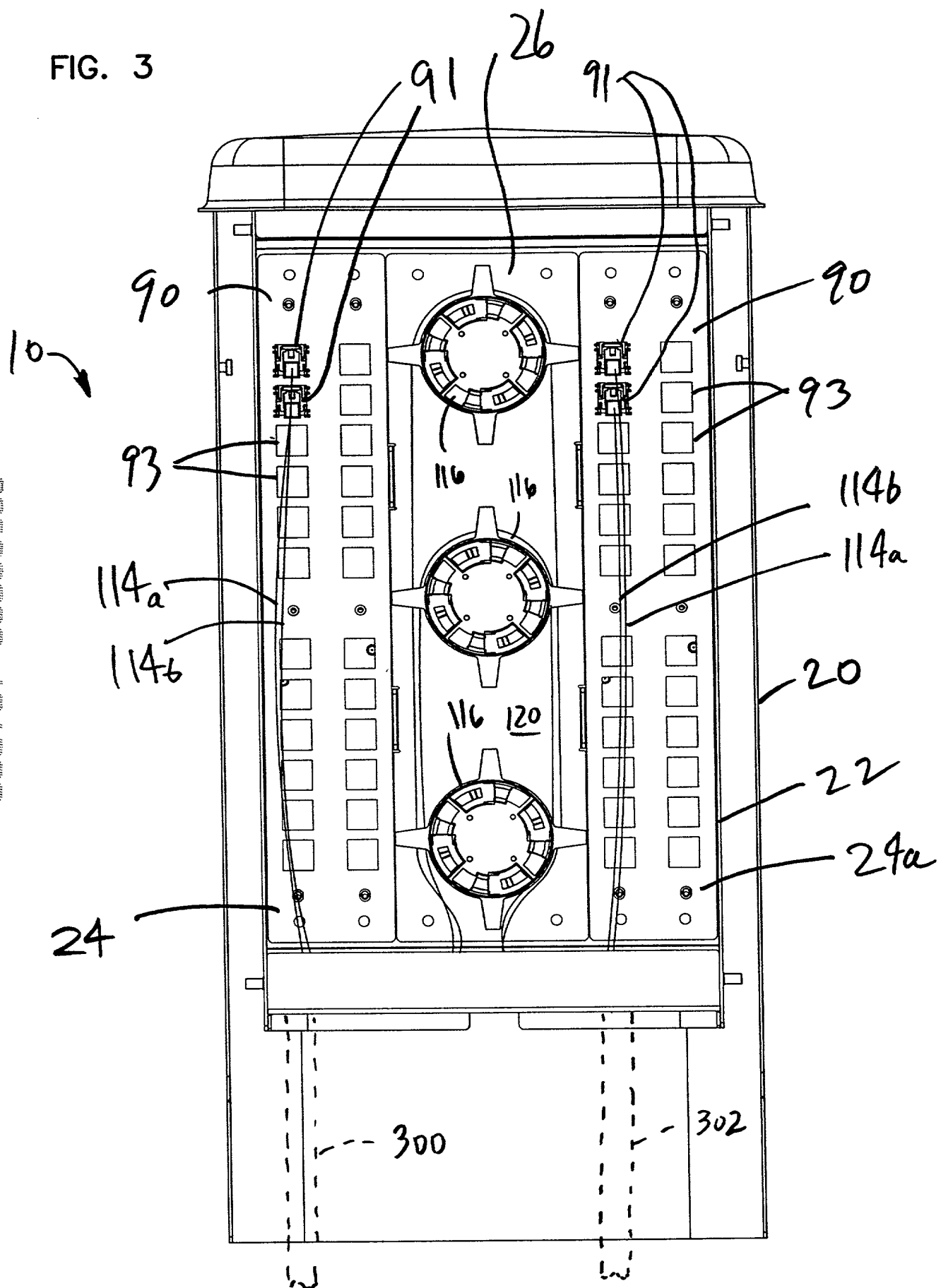


FIG. 4

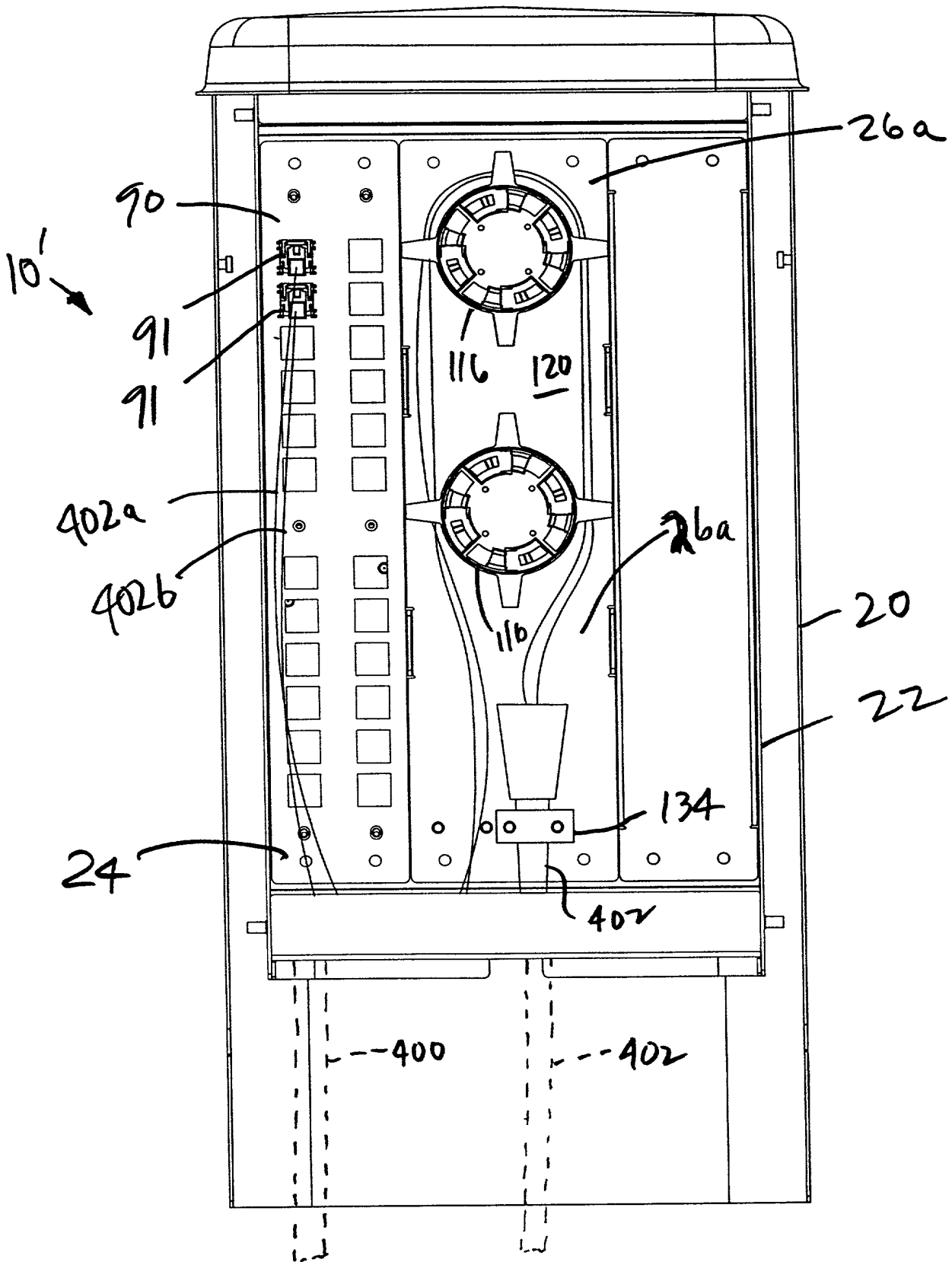
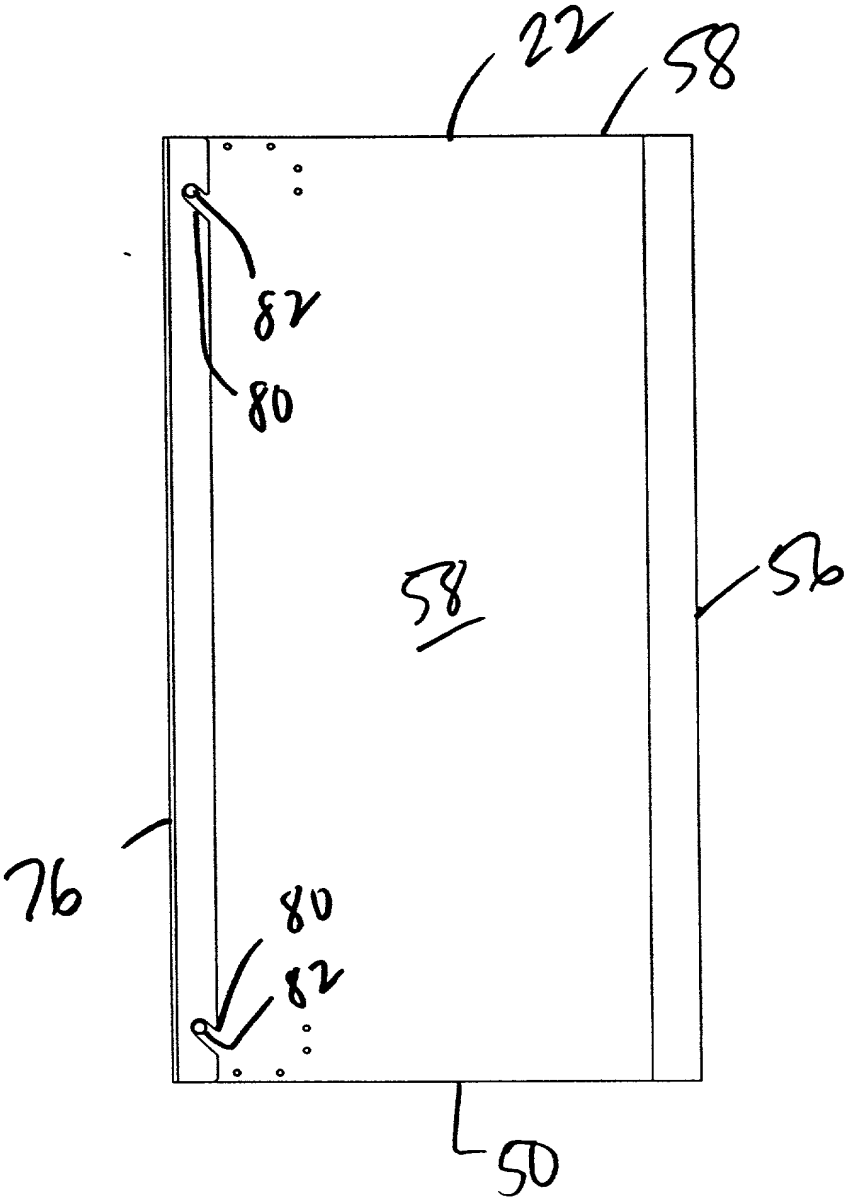


FIG. 6



002EFO1 686683960

FIG. 8

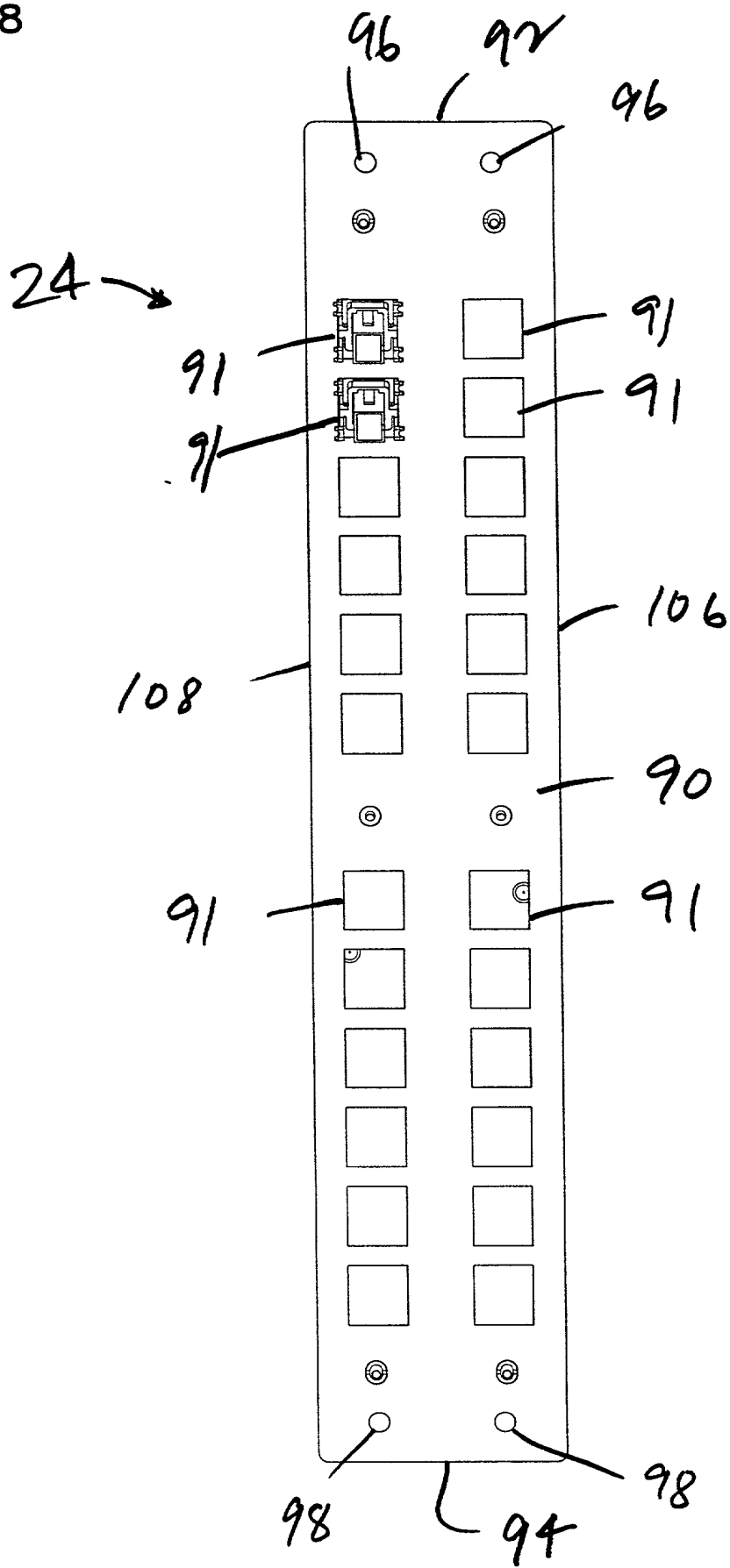


FIG. 9

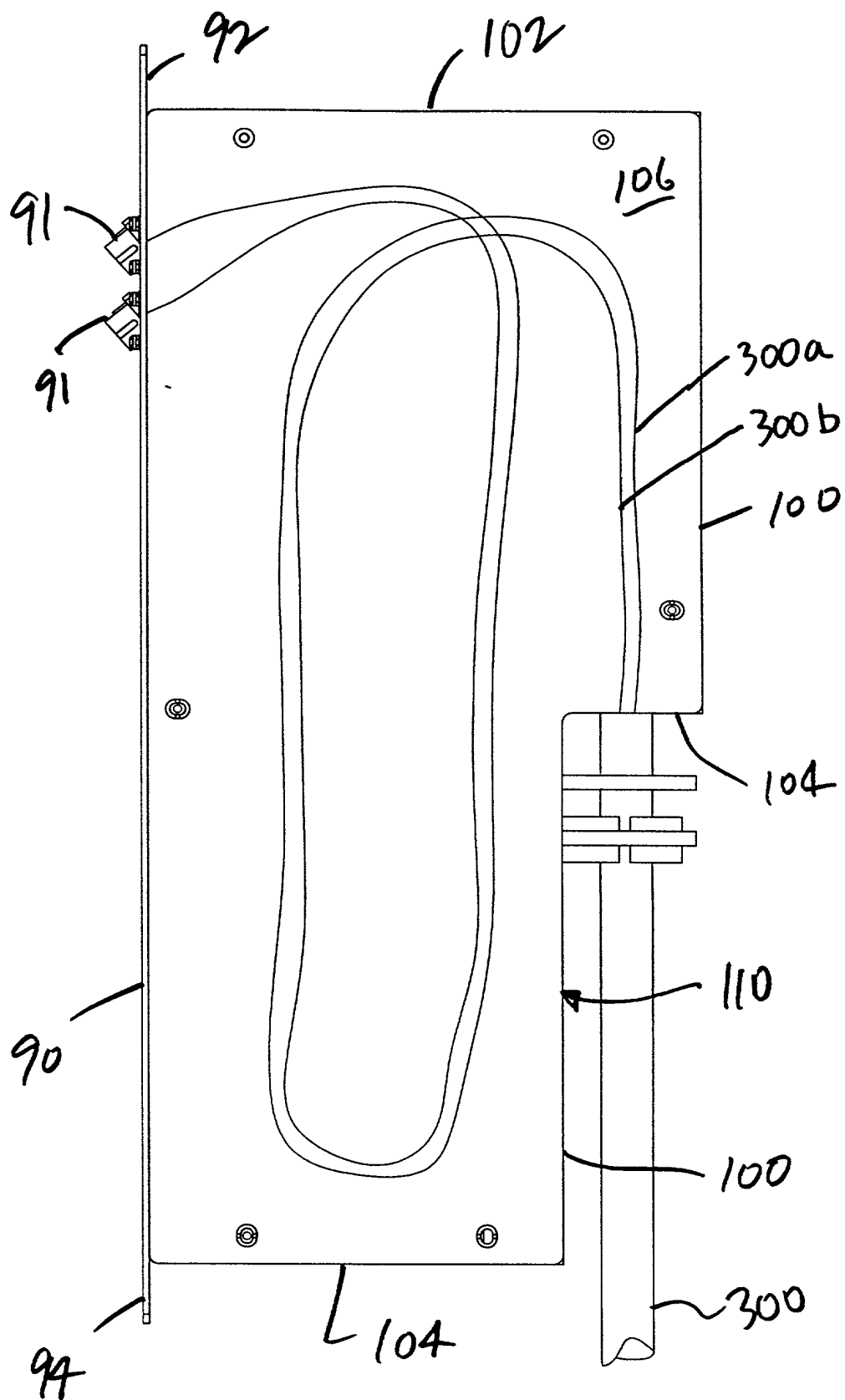


FIG. 10

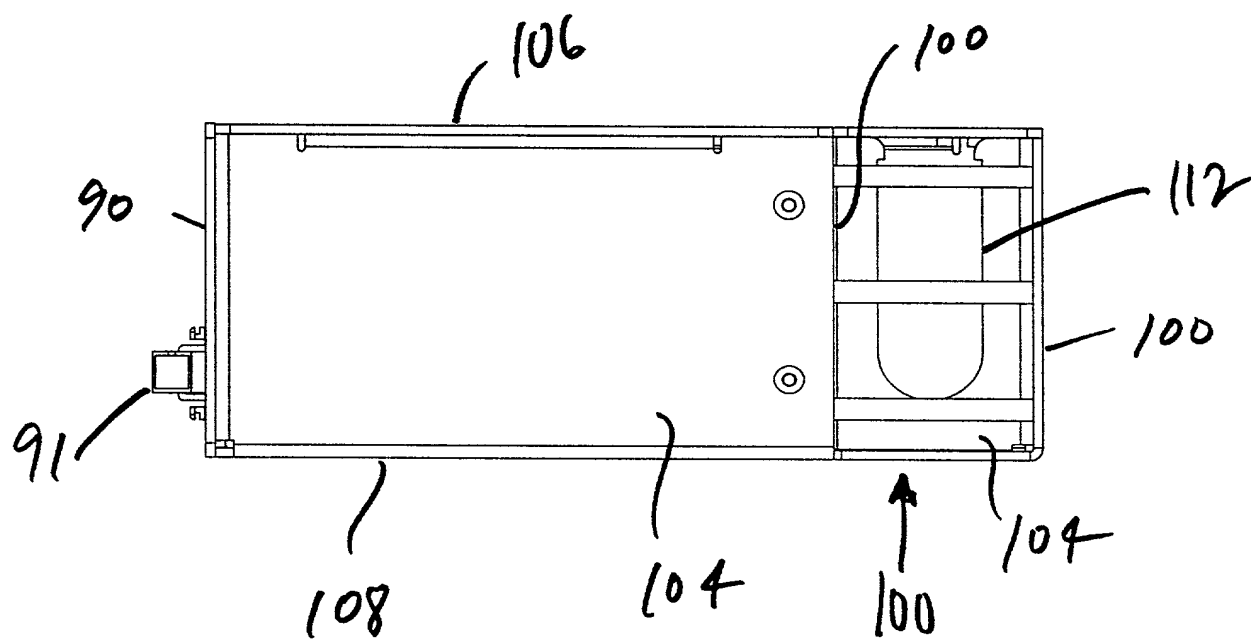


FIG. 11

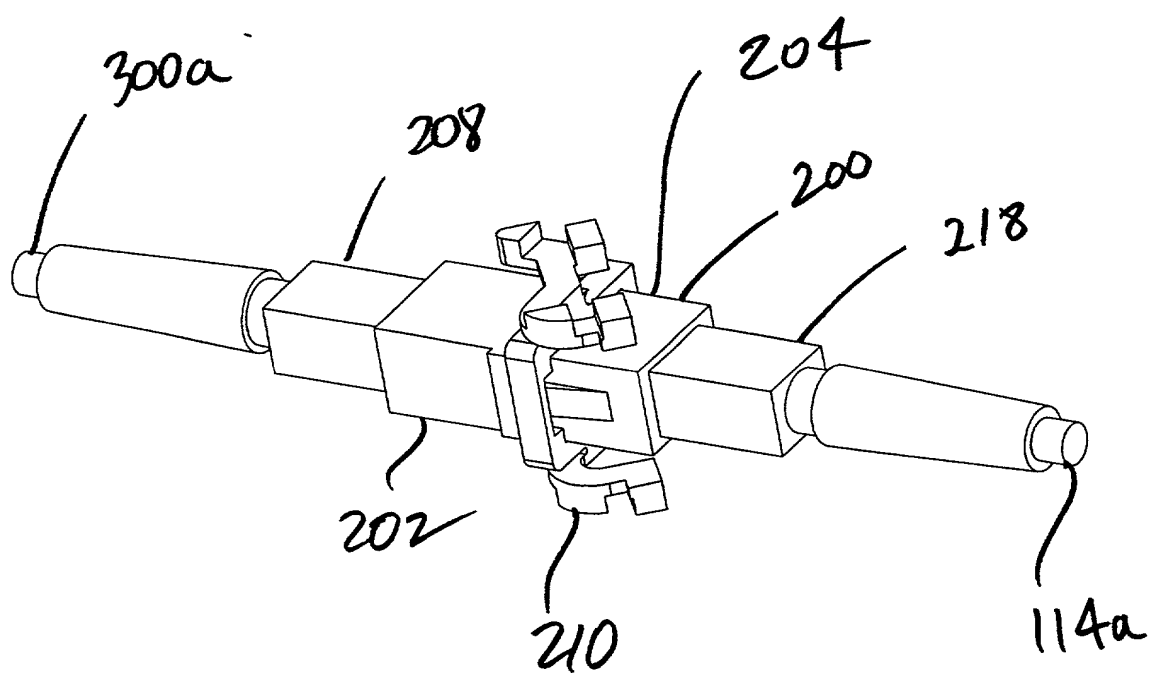


FIG. 12

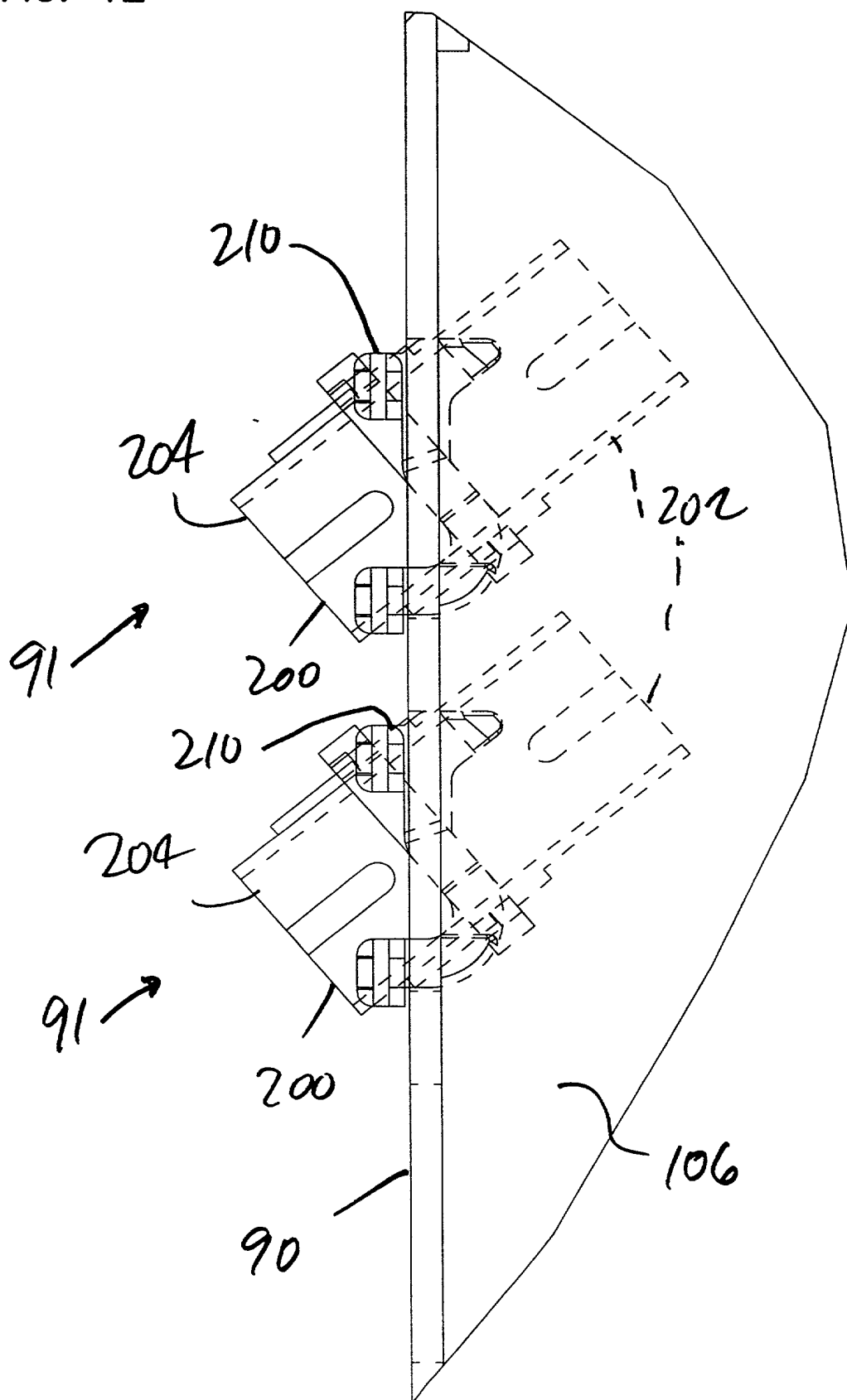
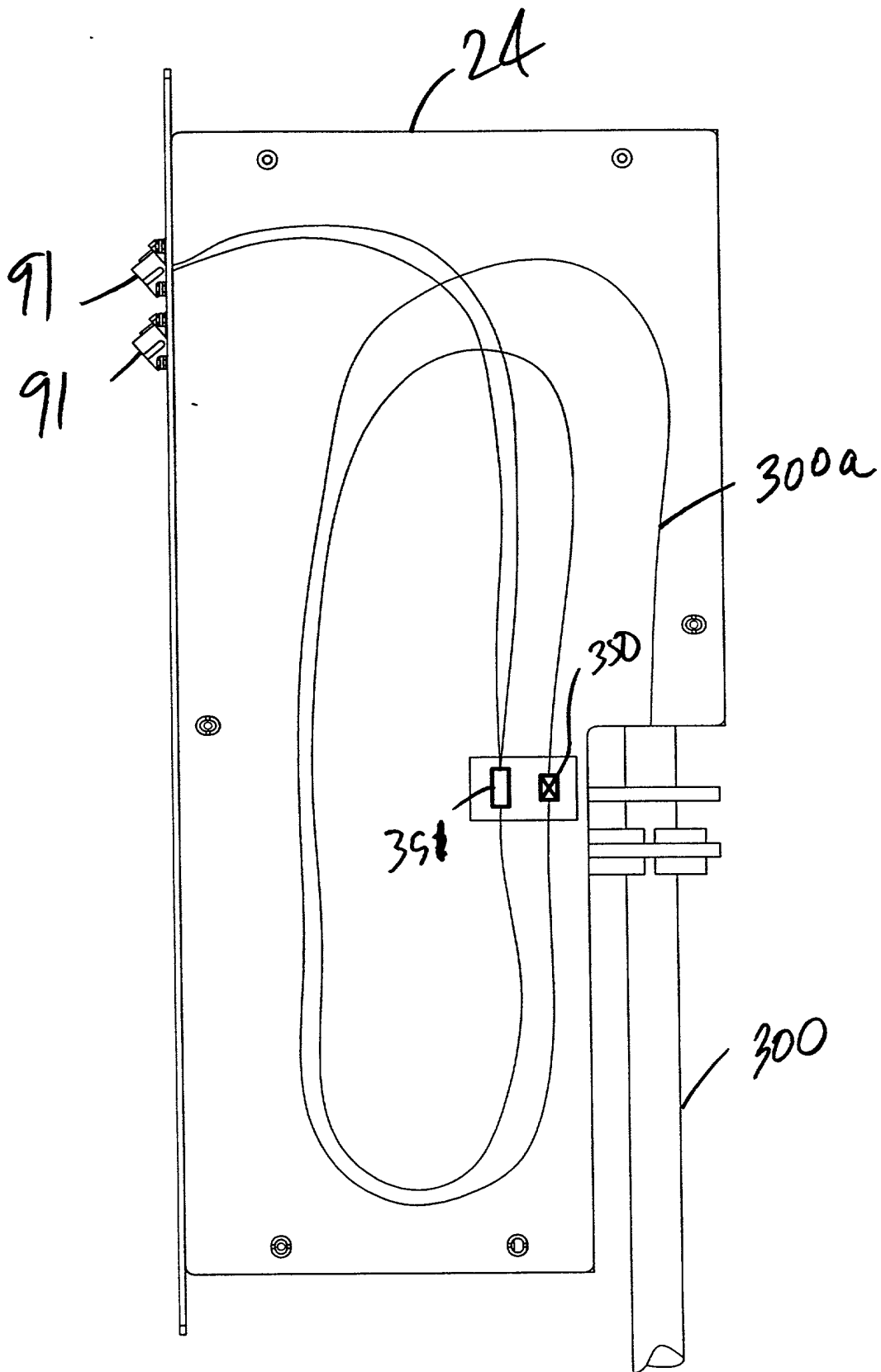


FIG. 13



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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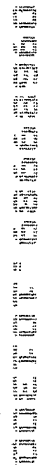


FIG. 15

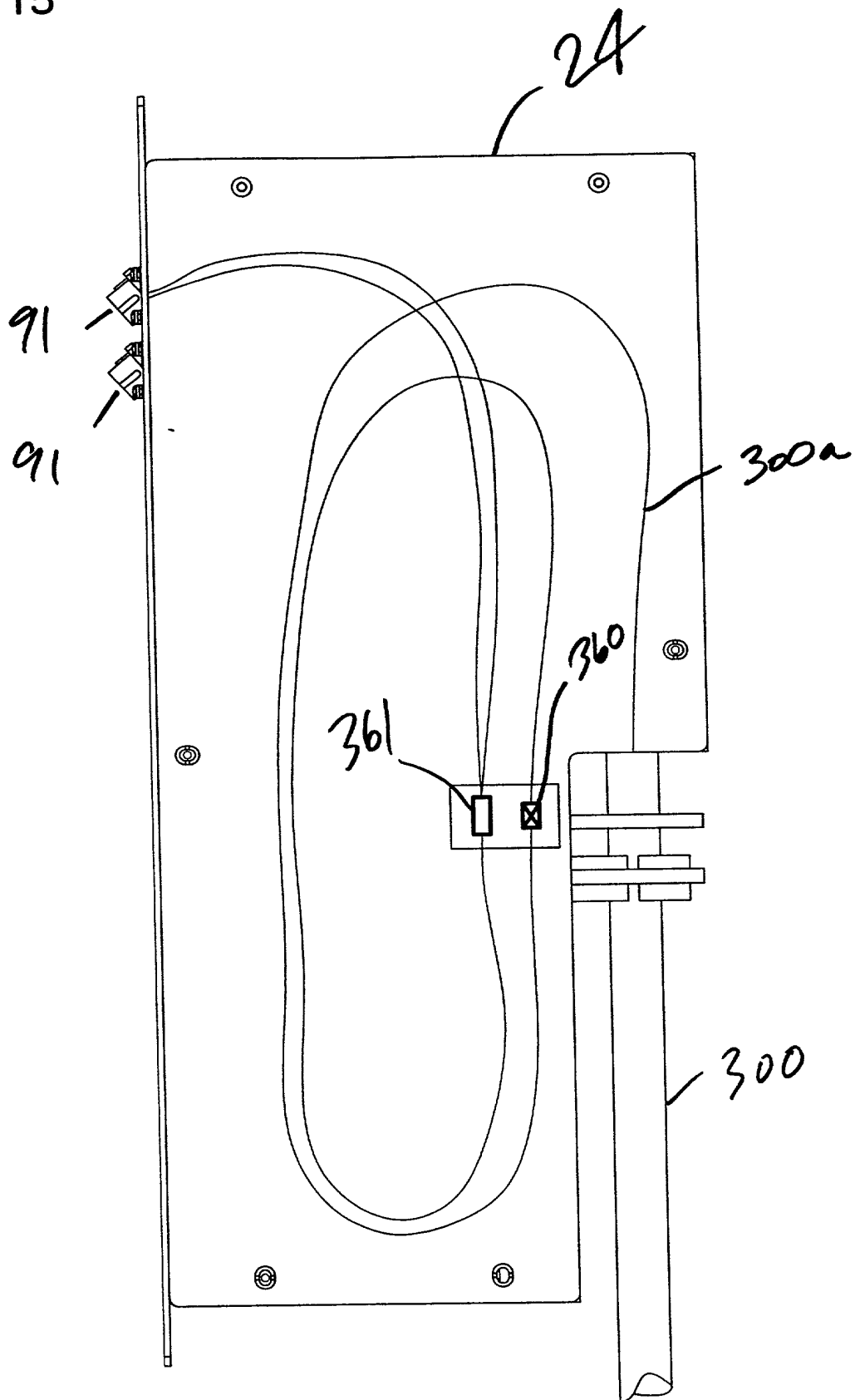


FIG. 16

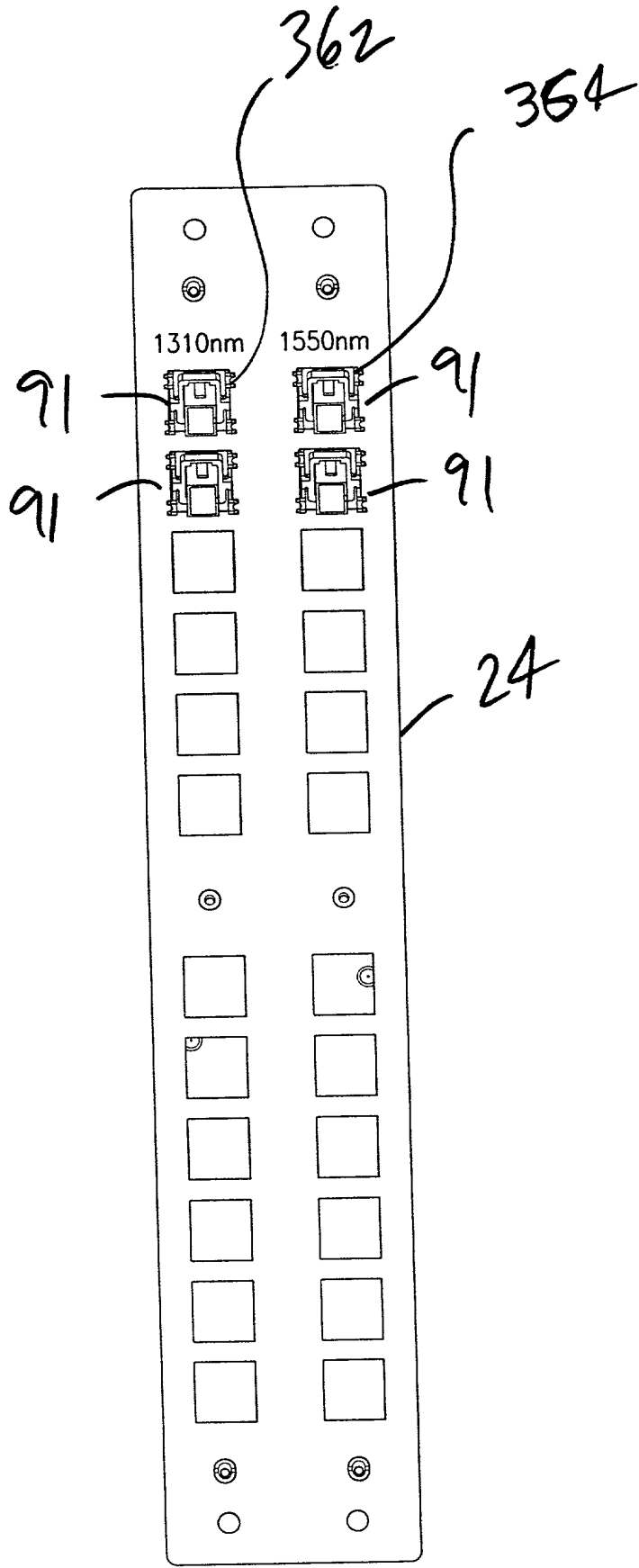


FIG. 17

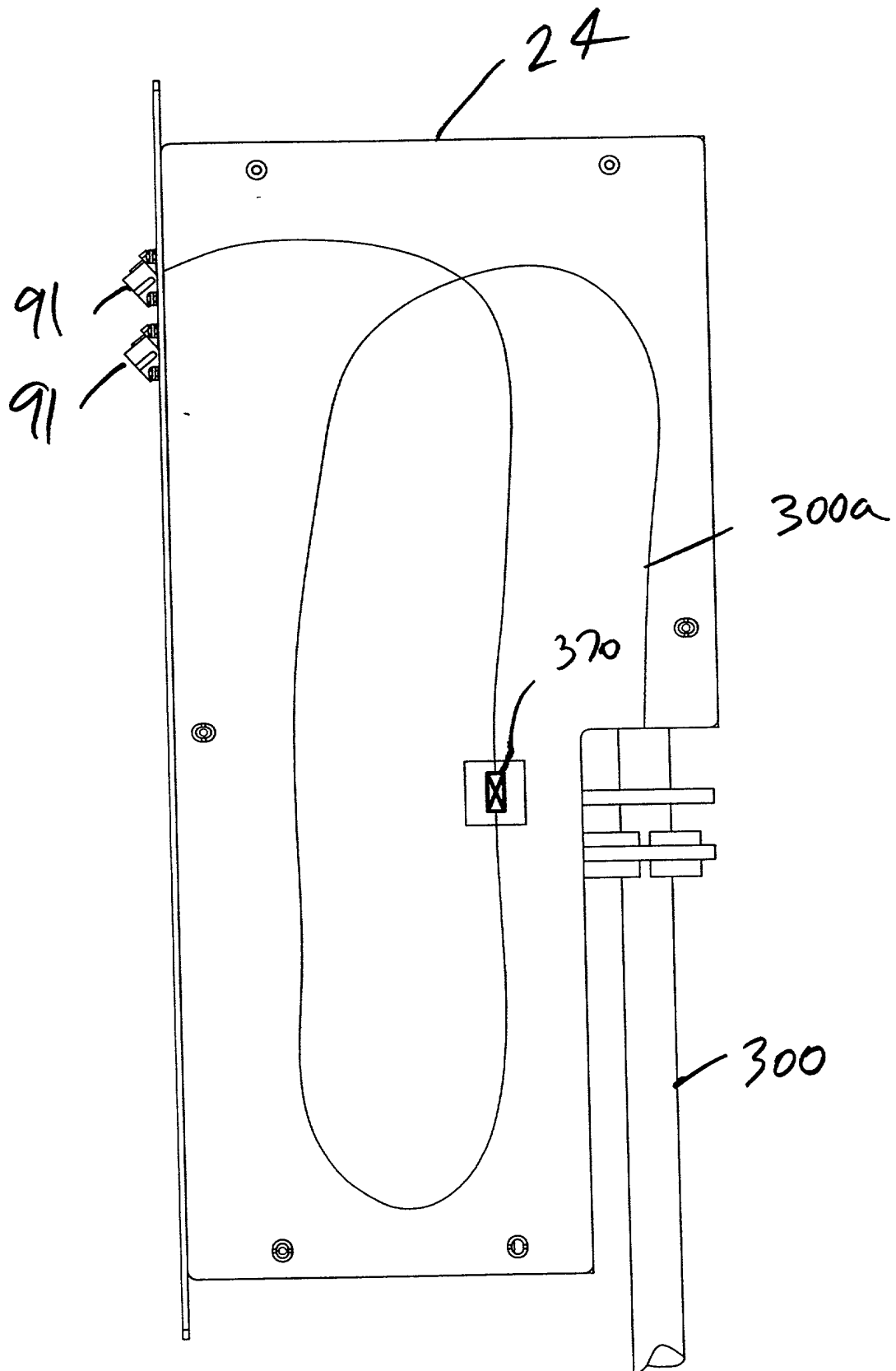


FIG. 18

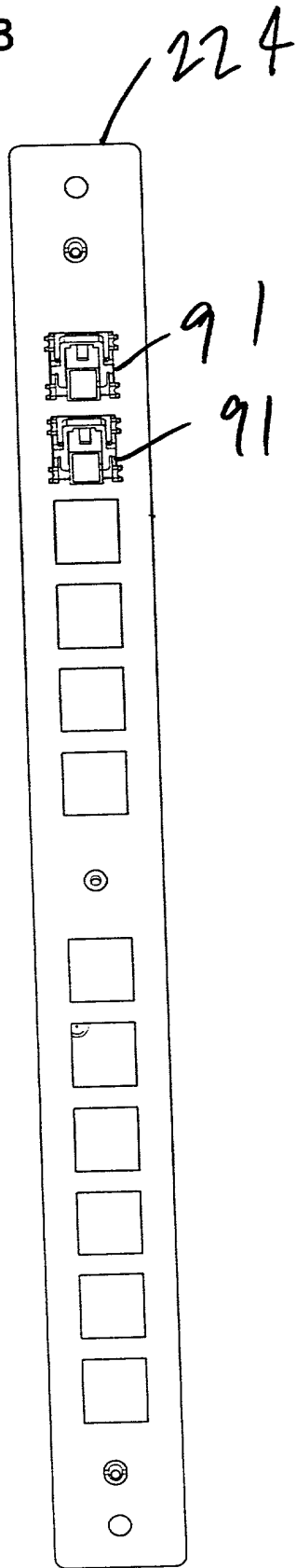


FIG. 19

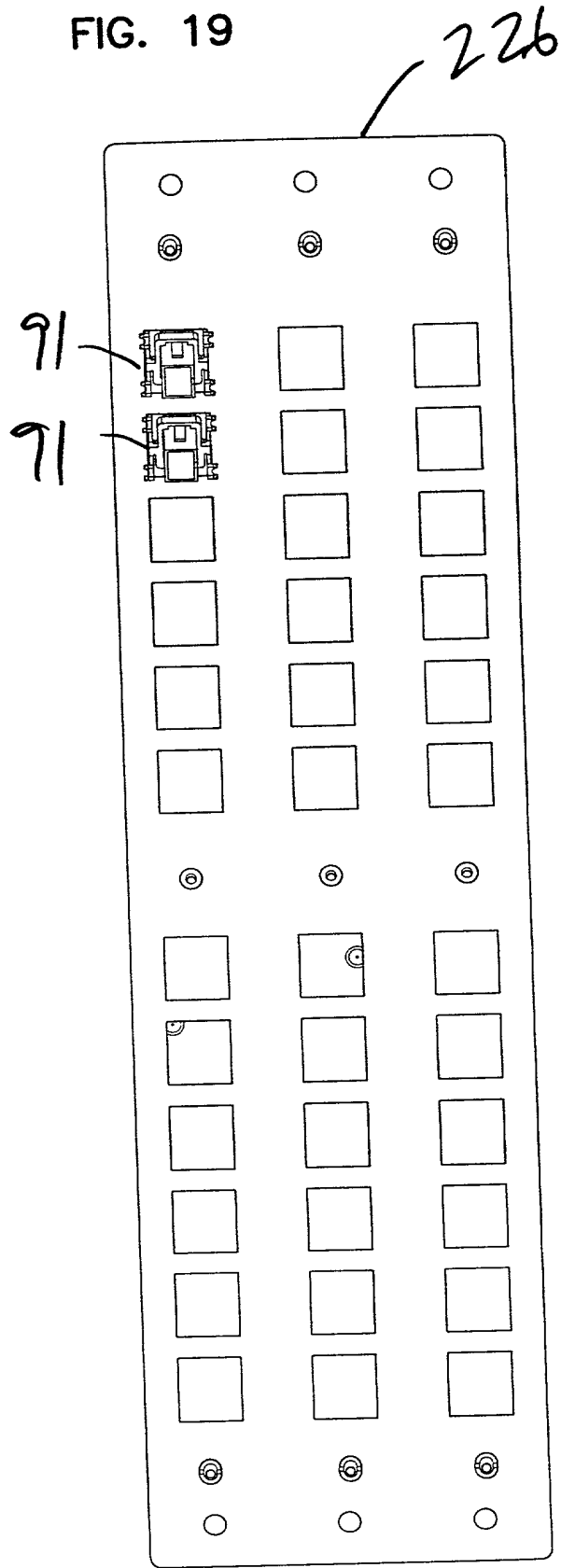


FIG. 20

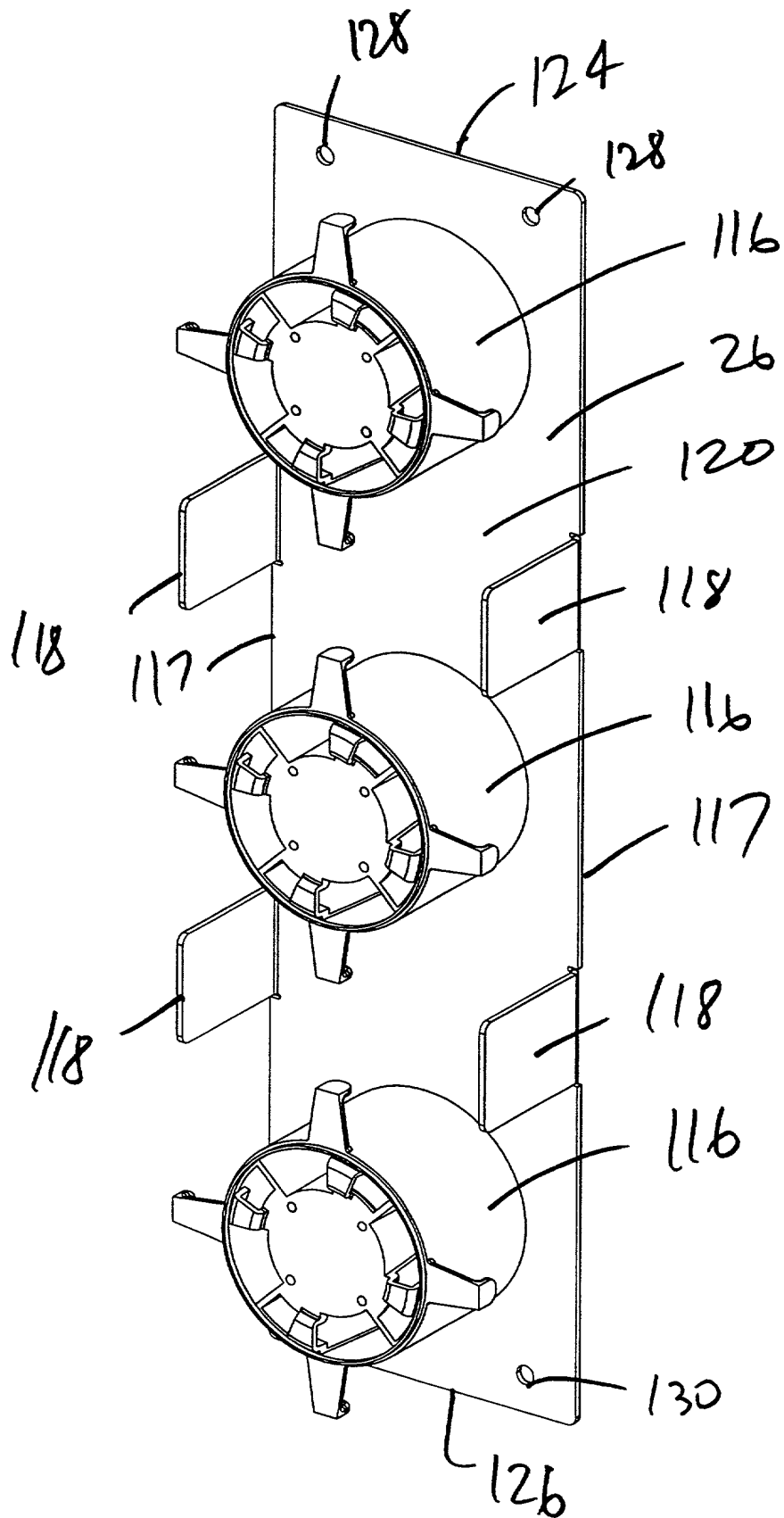
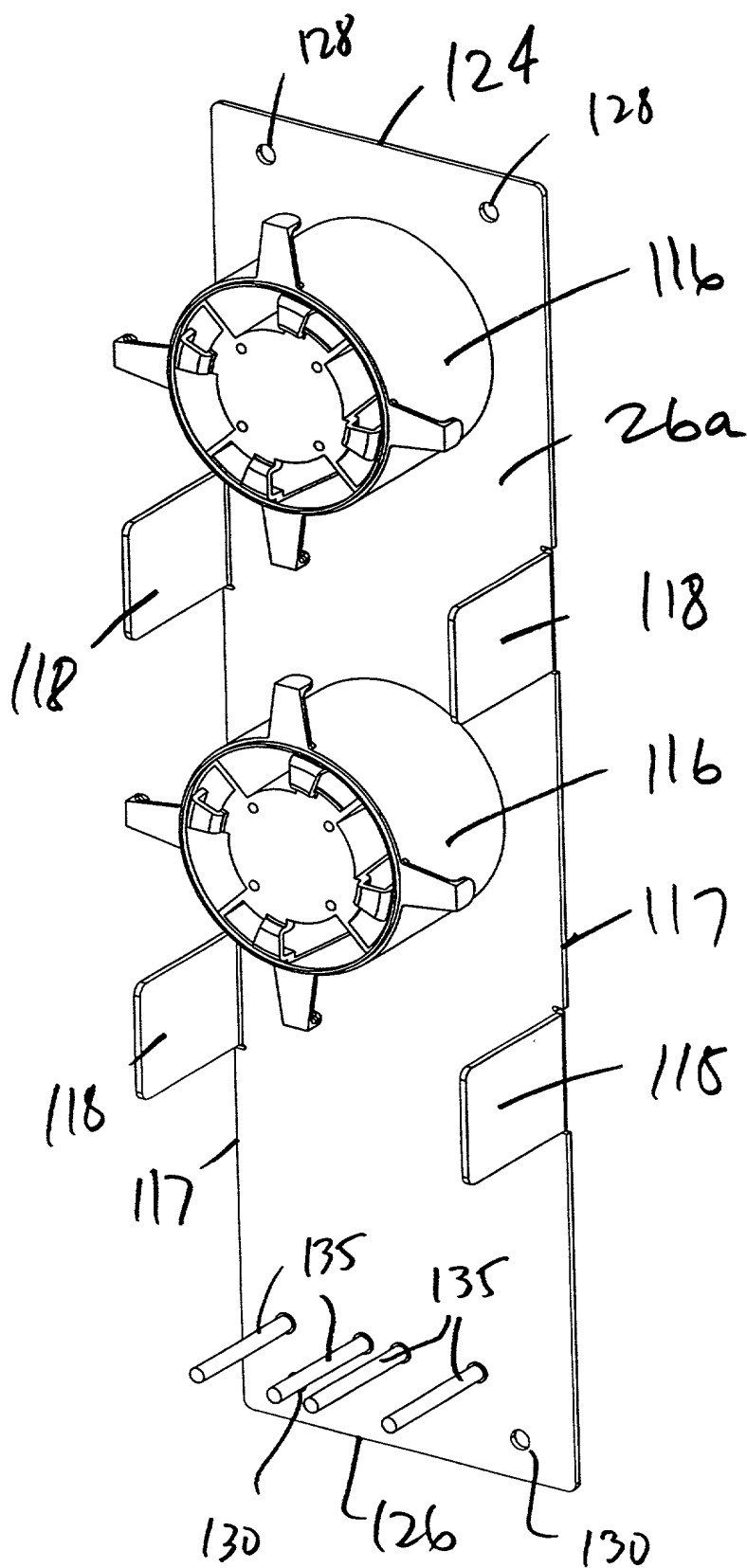


FIG. 21



United States Patent Application

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that

I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: OUTSIDE PLANT FIBER DISTRIBUTION APPARATUS AND METHOD

The specification of which

- a. ☒ is attached hereto
 b. ☐ was filed on as application serial no. and was amended on (if applicable) (in the case of a PCT-filed application) described and claimed in international no. filed and as amended on (if any), which I have reviewed and for which I solicit a United States patent.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56 (attached hereto).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on the basis of which priority is claimed:

- a. ☒ no such applications have been filed.
 b. ☐ such applications have been filed as follows:

FOREIGN APPLICATION(S), IF ANY, CLAIMING PRIORITY UNDER 35 USC § 119			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)
ALL FOREIGN APPLICATION(S), IF ANY, FILED BEFORE THE PRIORITY APPLICATION(S)			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)

I hereby claim the benefit under Title 35, United States Code, § 120/365 of any United States and PCT international application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below:

U.S. PROVISIONAL APPLICATION NUMBER	DATE OF FILING (Day, Month, Year)

I hereby appoint the following attorney(s) or patent agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith:

Albrecht, John W.	Reg. No. 40,481	Lacy, Paul E.	Reg. No. 38,946
Ansems, Gregory M.	Reg. No. P-42,264	Larson, James A.	Reg. No. 40,443
Batzli, Brian H.	Reg. No. 32,960	Lasky, Michael B.	Reg. No. 29,555
Beard, John L.	Reg. No. 27,612	Lindquist, Timothy A.	Reg. No. 40,701
Berman, Charles	Reg. No. 29,249	Lynch, David W.	Reg. No. 36,204
Black, Bruce E.	Reg. No. P-41,622	McDaniel, Karen D.	Reg. No. 37,674
Blasdell, Thomas L.	Reg. No. 31,329	McDonald, Daniel W.	Reg. No. 32,044
Bogucki, Raymond A.	Reg. No. 17,426	McIntyre, Iain A.	Reg. No. 40,337
Bruess, Steven C.	Reg. No. 34,130	Mueller, Douglas P.	Reg. No. 30,300
Byrne, Linda M.	Reg. No. 32,404	Nasiedlak, Tyler L.	Reg. No. 40,099
Canady, Karen S.	Reg. No. 39,927	Nelson, Albin J.	Reg. No. 28,650
Carlson, Alan G.	Reg. No. 25,959	Pauly, Daniel M.	Reg. No. 40,123
Carter, Charles G.	Reg. No. 35,093	Plunkett, Theodore	Reg. No. 37,209
Caspers, Philip P.	Reg. No. 33,227	Pytel, Melissa J.	Reg. No. 41,512
Chiapetta, James R.	Reg. No. 39,634	Reich, John C.	Reg. No. 37,703
Clifford, John A.	Reg. No. 30,247	Reiland, Earl D.	Reg. No. 25,767
Daignault, Ronald A.	Reg. No. 25,968	Rittmaster, Ted R.	Reg. No. 32,933
Daley, Dennis R.	Reg. No. 34,994	Schmaltz, David G.	Reg. No. 39,828
Dalglish, Leslie E.	Reg. No. 40,579	Schuman, Mark D.	Reg. No. 31,197
Daulton, Julie R.	Reg. No. 36,414	Schumann, Michael D.	Reg. No. 30,422
DeVries Smith, Kate	Reg. No. P-42,157	Sebald, Gregory A.	Reg. No. 33,280
DiPietro, Mark J.	Reg. No. 28,707	Skoog, Mark T.	Reg. No. 40,178
Edell, Robert T.	Reg. No. 20,187	Smith, Jerome R.	Reg. No. 35,684
Epp Ryan, Sandra	Reg. No. 39,667	Soderberg, Richard	Reg. No. -P-43,352
Farber, Michael B.	Reg. No. 32,612	Sumner, John P.	Reg. No. 29,114
Funk, Steven R.	Reg. No. 37,830	Sumners, John S.	Reg. No. 24,216
Glance, Robert J.	Reg. No. 40,620	Tellekson, David K.	Reg. No. 32,314
Golla, Charles E.	Reg. No. 26,896	Trembath, Jon R.	Reg. No. 38,344
Gorman, Alan G.	Reg. No. 38,472	Underhill, Albert L.	Reg. No. 27,403
Gould, John D.	Reg. No. 18,223	Vandenburgh, J. Derek	Reg. No. 32,179
Gregson, Richard	Reg. No. P-41,804	Victor, David W.	Reg. No. 39,867
Gresens, John J.	Reg. No. 33,112	Vradenburgh, Anna M.	Reg. No. 39,868
Hamre, Curtis B.	Reg. No. 29,165	Welter, Paul A.	Reg. No. 20,890
Hillson, Randall A.	Reg. No. 31,838	Whipps, Brian	Reg. No. P-43,261
Johnston, Scott W.	Reg. No. 39,721	Williams, Douglas J.	Reg. No. 27,054
Kastelic, Joseph M.	Reg. No. 37,160	Witt, Jonelle	Reg. No. P-41,980
Kettelberger, Denise	Reg. No. 33,924	Wood, Gregory B.	Reg. No. 28,133
Komanduri, Janaki	Reg. No. 40,684	Wood, William J.	Reg. No. P-42,236
Kowalchyk, Alan W.	Reg. No. 31,535	Xu, Min S.	Reg. No. 39,536
Kowalchyk, Katherine M.	Reg. No. 36,848		

I hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Merchant, Gould, Smith, Edell, Welter & Schmidt to the contrary.

Please direct all correspondence in this case to Merchant, Gould, Smith, Edell, Welter & Schmidt at the address indicated below:

Merchant, Gould, Smith, Edell,
Welter & Schmidt
3100 Norwest Center
90 South Seventh Street
Minneapolis, MN 55402-4131

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2	Full Name Of Inventor	Family Name Thompson	First Given Name Patrick	Second Given Name
0	Residence & Citizenship	City Roseville	State or Foreign Country Minnesota	Country of Citizenship U.S.A.
1	Post Office Address	Post Office Address 1259 Roma Avenue	City Roseville	State & Zip Code/Country Minnesota 55113 U.S.A.
Signature of Inventor 201:			Date:	
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2	Post Office Address	Post Office Address 7670 Berkshire Way N.	City Maple Grove	State & Zip Code/Country Minnesota 55311 U.S.A.
Signature of Inventor 202:			Date:	
2	Full Name Of Inventor	Family Name Tischler	First Given Name Anthony	Second Given Name L.
0	Residence & Citizenship	City Hastings	State or Foreign Country Minnesota	Country of Citizenship U.S.A.
3	Post Office Address	Post Office Address 11667 West Point Douglas Road	City Hastings	State & Zip Code/Country Minnesota 55033 U.S.A.
Signature of Inventor 203:			Date:	

§ 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)–(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim;

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application:

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.